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Effects of Watching Television While Exercising

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Effects of Watching Television While Exercising

by

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Abstract

Lack of physical activity is associated with multiple health risks including obesity, heart disease, and premature death. Encouraging people to increase exercise has been difficult due to multiple barriers such as lack of energy, time, and competition with sedentary behaviors. Many researchers have tried to manipulate distraction from pain and internal cues while exercising as a way to increase the amount a person exercises. Music has been found to be an effective distractor for decreasing perceived level of exertion and increasing the amount exercised in runners (Brownley et al., 1995; Bourdeaudhuij et al., 2002). The purpose of the current experiment was to examine the effects of television on increasing exercise by distracting participants whom are running on a treadmill. Forty-two adults from a small fitness center participated in a between-subjects design in which half viewed a television while exercising while the other half did not view a television while exercising. Distance walked/ran and focus of attention were compared to determine if watching a television while exercising distracted attention and increased distance walked/ran. A significant effect was found for distraction in that the television group reported more external thoughts than the no television group.

Effects of Watching Television While Exercising

Physical Activity

Statistics and Recommendations for Physical Activity

The World Health Organization (WHO) has announced that physical inactivity is one of the top 5 leading risk factors for all deaths globally. Over 31% of the world's population is not physically active (WHO, 2011). In 2007, the American College of Sports Medicine (ACSM) and the American Heart Association (AHA) published recommendations for adults to maintain and improve health through exercise (ACSM & AHA, 2007). The reason for these recommendations is that lack of physical activity is a major public health issue and that there has been increasing evidence that physical activity levels have been decreasing over the years rather than increasing (Haskell et al., 2007). For example, in 2005, less than half of U.S. adults met the original 1995 recommendations for physical activity, which were that adults should exercise thirty minutes or more everyday at moderate-intensity. Men were slightly more likely to meet these recommendations than women. Younger people (18 to 24 years) were 20% more likely to meet recommendations than older people (65 years and older) (Haskell et al., 2007). Further, Harrison, McElduff, and Edwards (2006) found that only 27% of those sampled in Europe exercised at least five times a week at moderate to vigorous physical activity. Physical activity was more likely in people who did not smoke and ate the recommended five servings of fruits and vegetables a day. Even 'healthy' participants (i.e., those who did not report health conditions when surveyed) were only 8% more likely to exercise than "nonhealthy" participants. These statistics suggests the need to promote increasing exercise (Harrison et al., 2006).

In order to emphasize the need for exercise, The American College of Sports Medicine and the American Heart Association (2007) released more guidelines that are clearer than were previously stated in their 1995 recommendations. For healthy adults between ages 18 and 65 years old, exercise should be performed at a moderate-intensity for a minimum of thirty minutes five days a week, or at a vigorous-intensity for twenty minutes three days a week. Vigorous activity causes rapid breathing and significant increase in heart rate. Running, shoveling, carrying heavy loads, and swimming can all be considered vigorous activity. Moderate-intensity activity noticeably accelerates the heart but is not as intense as vigorous activity. Activities that can be associated with this intensity are walking at 3.0 mph, sweeping floors, playing badminton, and golfing (ACSM & AHA, 2007). The recommendations also note that the benefits of exercise exhibit a dose-response, meaning that the more a person exercises the better he or she can improve health, reduce the risk of unhealthy weight gain, and reduce risk for chronic diseases (Haskell et al., 2007).

Recently the U.S. Department of Agriculture (USDA) and the U.S. Department of Health and Human Services (HHS) released their 2010 dietary guidelines for Americans with considerable insistence that Americans need to not only increase healthy eating patterns but also increase physical activity in order for people to gain control of and maintain healthy weights. This emphasis comes as a result of an obesity epidemic that does not appear to be ending. The guidelines include advice in how to incorporate the suggestions into everyday life like drinking water instead of sugary drinks and filling half your plate with fruits and vegetables. Creating a balance of calories and physical activity is the key message (USDA & HSS, 2010).

Health Risks of Inactivity

Physical inactivity is associated with multiple health risks. There are 3.2 million deaths and over 670,000 premature deaths (i.e., people under age 60) per year associated with physical inactivity (WHO, 2011). Physical activity is the number one adjustable lifestyle preventative for many chronic diseases, including cancer. Between 9 and 19 percent of cancers can be attributed to lack of physical activity. Risks for colon, breast, and endometrial cancers have been found to be the most affected by increases in physical activity (Friedenreich, Neilson, & Lynch, 2010).

A growing problem in the United States that is, in part, a result of inactivity is obesity. Obesity has been defined as having a Body Mass Index (BMI) of 30.0 kg/m^2 or greater in adults and having a BMI of the 95th percentile or greater in children and adolescents. The prevalence rate for obesity has increased dramatically from being 15% of adults in 1970 to 34% of adults in 2008. Among adolescents 12 to 19 years old, the obesity rate has jumped from 6% in 1970 to 18% in 2008. In 1990, no state had a prevalence rate of more than 25%, but 32 states did in 2008 (USDA & HSS, 2010).

Obesity is a major concern because it increases a person's risk for health problems such as Type 2 diabetes, heart disease, certain types of cancers, and premature death. Diseases associated with weight (e.g., high blood cholesterol, hypertension) that previously had been only observed in adults are now being diagnosed in children who have excess body fat. Research has also found that children who grow up being overweight are at a higher risk for being overweight as adults and developing diseases associated with weight later in life (USDA & HSS, 2010).

Health Benefits of Physical Activity

Regular physical activity is associated with multiple health benefits including increasing mood (Birkeland, Torsheim, & Wold, 2008), lowering stress response (Rimmele et al., 2009), increasing bone mass and muscle strength (Jonsson, Ringsberg, Josefsson, Johnell, & Birch-Jensen, 1992), decreasing risk for osteoporosis (Schmitt, Schmitt, & Doren 2009), enhancing memory (Smith et al., 2011), promoting memory storage (Pesce, Crova, Cereatti, Casella, & Bellucci, 2009), preventing decline in cognition in type 2 diabetics (Colberg, Somma, &

Sechrist, 2008), and reducing high blood pressure and cholesterol levels (Thorndike, Healey, Sonnenberg, & Regan, 2011).

A longitudinal study of physical activity and mood showed that having a higher level of physical activity was associated with increased mood. However, being physically active in youth did not protect against a depressed mood later in life, nor did being depressed in youth become a barrier to physical activity later in life (Birkeland et al., 2008).

Rimmele et al. (2009) examined the role that the level of physical activity plays in moderating stress responsiveness. Trained individuals (determined by a physical activity test and self-report of physical activity) displayed lower cortisol, heart rate, and state anxiety responses compared with untrained individuals in response to a psychosocial stress. The psychosocial stressor consisted of a public speaking task and a mental arithmetic task that was to be performed out loud in front of a video camera with two evaluators. Although all participants, regardless of physical activity, exhibited a stress response, those with a higher level of physical activity displayed the lowest cortisol, heart rate, and psychological responses (Rimmele et al., 2009).

The effects of physical activity on bone mass and muscle strength were examined in women ages 38 to 64 years old. Thirty women were instructed to jog once a week for at least three years and were compared to a control group that was inactive and matched for age. The active group had more quadriceps strength and balance than the inactive group. Active women over age 50 had a higher trabecular bone mass than the inactive group. The study demonstrates the benefits physical activity can have on bone mass and strength (Jonsson et al., 1992). Schmitt et al. (2009) showed that women between the ages of 50 and 84 whom are physically active have a lower risk for hip fractures. The researchers concluded that the more physically active postmenopausal women are; the slower the bone loss, which lowers their risk for osteoporosis.

Pesce et al. (2009) investigated the effects of physical activity on free-recall memory in 11 and 12 year olds. Students' memory was tested directly after physical education lessons. Recall scores were higher following physical activity than during baseline sessions that were not proceeded by activity. The results show that physical education classes may promote memory storage (Pesce et al., 2009). Enhanced memory has also been reported in physically active adults that have a genetic risk for Alzheimer's disease (Smith et al., 2011).

Colberg et al. (2008) found an increase in cognitive function scores on two tests (i.e., Mini-Mental State Exam and Saint Louis University Mental Status Exam) among participants with type 2 diabetes who were physically active. The authors suggest that participating in physical activity has the potential to prevent, or at least minimize, the decline in cognition associated with type 2 diabetes.

Thorndike et al. (2011) examined how participation in a worksite physical activity and nutrition program could reduce cardiovascular risk factors, like high blood pressure and cholesterol. The average weight loss at the end of the program was 4.2 lbs and .9 lbs at one year. The average cholesterol and blood pressure levels were lower at the end of the program and at one year. This study demonstrates how programs that promote physical activity and eating healthy can lower risks for cardiovascular diseases and encourage weight loss.

As a testament to just how much it is thought that regular exercise is associated with health benefits, the World Health Organization released a statement in February of 2011 that 150 minutes of activity a week can reduce the risks of developing diabetes and heart disease, and certain cancers, which include breast and colon cancers (WHO, 2011).

Barriers to Physical Activity

Although there are clearly many benefits of exercising, the problem is trying to motivate people to adhere to regular exercise programs and finding ways to get people to exercise longer and with a greater intensity. About 40 to 65% of individuals who start new exercise programs drop them within the first six months (Annesi, 2001). Many barriers have been found that deter people from physical activity including lack of time, other priorities, family commitments, cost, and weather. Enjoyment and preference were found to be associated with increased levels of physical activity (Salmon, Owen, Crawford, Bauman, & Sallis, 2003).

Gyurcsik, Spink, Bray, Chad, and Kwan (2006) conducted a cross-sectional study to identify barriers to physical activity in 291 students from grade 7 to students' first year at a university. Students were given a survey that asked if there were any physical activities that they would have liked to do in the last six months (for the 7th through 12th graders) or the last six weeks (for the university students) but did not. Students were then instructed to list five barriers (operationally defined as "anything that may stop you from doing physical activity") that prevented them from physical activity. There were 882 barriers that were divided into five categories based on an ecological model. Physical barriers had to do with the actual physical environment such as when an area lacks biking or running trails. Intrapersonal barriers were characteristics of the individual in which the individual had negative views towards physical activity. Interpersonal barriers were when a person's social networks were not supportive of physical activity. Community barriers were when recreational facilities limited the amount of opportunities available for physical activity. Public policy barriers involved local, state, and national laws that prevented physical activity, including not being able to bike on a trail.

Gyurcsik et al. (2006) found evidence that the barriers that prevented students from physical activity varied at different grade levels. Grades 7 through 12 reported intrapersonal barriers to be their biggest obstacle, while university freshmen reported institutional barriers prevented them from physical activity. As grade level increased, so did the average number of barriers that were reported. There were differences within barrier categories among the grade levels. For example, the two main intrapersonal barriers for grades 7 through 12 were lack of motivation and lack of skill, while university students reported health issues like illness or injury that prevented them from working out. The study is limited in that it asked participants about physical activity barriers that happened during the winter months, however, it does show that there are multiple barriers that prevent people from being physically active.

Another study, Puglisi, Okely, Pearson, and Vialle's (2010), examined perceived barriers to physical activity and barriers that prevent decreasing small screen recreation behaviors, such as watching DVDs and playing video games, in obese children. The study also examined if participants knew strategies to overcome the barriers. Parents and children were interviewed, filled out questionnaires, and attended focus groups.

One of the major themes that emerged was family dynamics, which involved parents complaining that chores limited their time to engage in physical activity with their child. Perceived competence was another theme in which children would quit activities if they thought their friends were better than them. This conclusion is consistent with Gyurcsik et al.'s (2006) intrapersonal barrier where 7^{th} through 12^{th} graders reported not having the skill set for certain physical activities.

The main themes that prevented decreasing small screen recreation were also family dynamics, lack of social support, physical environment, and characteristics of the child. Many households did not have rules limiting the time spent in small screen activities. The lack of energy and time of parents to promote physical activity influenced them to use television to occupy their children. Children also reported enjoying small screen recreational activities more than physical activity (Puglisi et al., 2010).

Parents and children were able to come up with a few ways to increase physical activity like participating in activities that were more suited to their child's interests and abilities as well as involving the entire family in activities. It was more difficult for them to come up with ways to reduce sedentary behaviors. The main suggestions were to either remove the television or place limits on the time spent participating in small screen recreational activities (Puglisi et al., 2010).

Jewson, Spittle, and Casey (2008) examined physical activity barriers to moderate physical activity in overweight women. Thirty women aged 25 to 71 years with an average BMI of 31.2 kg/m^2 participated in a self-report survey. The main barriers to physical activity of women who were already active (i.e., indicated in self-report) were weather, time, illness, injury, family, travel time, tiredness, and too lazy. For women whom were considered inactive, the main barriers were time, too lazy, health, family, illness, and injury. Both groups indicated that fitness, weight loss, and health were major facilitators in motivating them to exercise.

Gyurcsik et al. (2006), Jewson et al. (2008), Puglisi et al. (2010), and Salmon et al. (2003) convey the need to develop ways to overcome physical activity barriers and decrease sedentary behaviors.

Role of Distraction

Previous research has focused on distraction as a key ingredient in encouraging people to exercise longer without realizing it. For example, listening to music (Bourdeaudhuij et al., 2002), watching television (Annessi, 2001), and using virtual reality enhanced-exercise equipment (Annessi & Mazas, 1997) have been examined to try to divert people's attention away from exercising. There are three main ways that distraction may work to increase exercising. First, distraction may serve to increase a person's preference or enjoyment of exercise, which may make them more likely to continue to exercise (Green, Reid, Passante, & Canipe, 2008; Lancioni et al., 2004; Salmon et al., 2003). Second, distraction can have an effect on time perception by decreasing the amount of time a person thinks he or she is engaging in a task, like exercising (Tobin & Grondin, 2009). Lastly, distraction can have an effect on attention allocation by shifting focus away from exercising (Brewer & Karoly, 1989; Razon, Basevitch, Lang, Thompson, & Tenenbaum, 2009; Schucker, Hagemann, Strauss, &Volker, 2009; Tenenbaum & Connolly, 2008).

Preference/Enjoyment of Task

Distraction may lead to an increase in enjoyment and preference ratings which have been linked to increases in exercise (Salmon et al., 2003). Green et al. (2008) showed that increasing preference for a task can increase enjoyment of the task. Tasks rated as highly nonpreferred by supervisors in a human service field were manipulated to increase work enjoyment by making those tasks more preferred by the supervisors. This was done by surveying what supervisors did and did not like about the task and changing the task by removing the things that were disliked about the task and keeping or adding things that were liked about the task. After the intervention was implemented, preference ratings for the tasks and supervisors' ratings of quality of work life increased. Work quality also remained high throughout the intervention. The experiment shows that by increasing preference for the task, enjoyment for the task increases as well as performance of the task (Green et al., 2008).

Lancioni et al. (2004) attempted to increase physical activity in people with multiple disabilities (i.e., deaf, blind) by seeing if presenting their clients with their favorite stimuli while they exercised on a treadmill would increase enjoyment. People with multiple disabilities tend to not be very active. By allowing the person to pick out four or six of the person's favorite stimuli (e.g., recordings of music, messages of encouragement), it was hypothesized that it would increase enjoyment of exercise through positive reinforcement. Three adults participated in the experiment. Sessions were video taped and scored for indices of happiness (e.g., smiling, laughing, or excited vocalization). Each session lasted five minutes. In sessions with the stimulus, the stimulus was presented for 15 seconds every 60 second. In sessions without the stimulus, participants walked for five-minutes without any stimulus presented to them. Participants were required to walk at a comfortable pace. The results showed that when a favorite stimulus was present, participant's mood increased (i.e., exhibited more smiling, laughing). The authors concluded that increasing preference can increase happiness when being physically active (Lancioni et al., 2004).

Although Russell et al. (2003) showed that reading or watching television while exercising did not increase mood, this result could be due to participants not enjoying the distraction that was given. Participants exercised on a bicycle for 25 minutes at 60 to 75% of their individual heart rate reserve (based on a participant's resting heart rate). Profile of Mood States (POMS) was completed 5 minutes before exercise and 5 minutes after. The video and reading material provided were standardized health material which the participant may or may not have been interested in. Pre-exercised and post-exercised scores on the POMS did not significantly differ based on exercise condition, indicating that the type of distraction did not have an effect on enjoyment. If the material was something they enjoyed, this may have led to an increase in mood because the experience would be more enjoyable. The authors concluded that it may be the enjoyment of the content of the distraction that matters for increasing exercise and not just whether a distraction is present or not (Russell et al., 2003).

Time Perception of the Task

Distraction can also have an impact on time perception. From neuroimaging data, there is evidence for two time scales that influence perception of time. The automatic timing system is associated with timing on small scales, such as sub-second timing, while the cognitively controlled timing system is associated with longer scales like seconds, minutes, days, and years (Eaglement, 2008). Each of these neural systems exhibit distinct characteristics that include different responses, durations, and patterns of brain activity. The automatic timing system measures time when tasks are continuous and predictable, and do not require a lot of attention. This system is primarily associated with the motor system. The cognitively controlled system requires attention and the use of working memory and utilizes the prefrontal and parietal cortices. When a task requires direct attention, the cognitively controlled system of timing is engaged (Lewis & Miall, 2003).

Eagleman's (2008) overview of current neurobiology showed that the brain's estimates of time are not usually related to the actual time that has passed. Time perception is a function of many characteristics of things going on at the time of an event. When a stimulus is shown repeatedly, time seems to go by faster. However, the first time the stimulus is shown, time is interpreted as going slower (Eagleman, 2008).

Tobin and Grondin (2009) investigated the effects video games have on time perception in adolescents, particularly on the cognitively controlled system (Lewis & Miall, 2003). Students were assigned to either a prospective paradigm (told would have to answer questions about duration after completing tasks) or a retrospective paradigm (told they would answer questions about difficulty level after completely the tasks). Each student participated in three consecutive tasks: playing a video game, reading, and playing a video game again. The length of the video game was either 24 or 8 minutes long and the reading task was 8 minutes long. Participants recorded how much time they thought had elapsed in each of the tasks and total duration after all three had been completed. Overall, participants overestimated short durations (8-minute tasks) and underestimated longer duration tasks (24-minute tasks); however, total duration of all three tasks was estimated almost accurately. The results showed that participants estimated the 8 minute reading task as being longer than the 8 minute video game task. The video game was also rated as more pleasant and enjoyable than the reading task suggesting preference for the task had an effect on time perception (Tobin & Grondin, 2009).

Shifting Focus

An effort-related model of attention. Distraction can have an effect on the allocation and shifting of attention. An effort-related model has been used to describe how attention can be diverted through use of a distraction (Razon et al., 2009). People engage in associative or dissociative strategies that direct their attention. An associative strategy is when people focus internally on how their body is feeling and reacting. A dissociative strategy is focusing externally, away from somatic cues. The goal in distraction is to get people to use a dissociative strategy while exercising by directing attention away from the body (Razon et al., 2009).

Brewer and Karoly (1989) examined how using the dissociative strategy could help people cope with pain. They found that when participants were not focusing internally, when completing high and low intensity pressure simulations, they were better able to cope with pain. This finding implies that if you focus on something other than the actual pain you are experiencing, you are better able to cope with that pain.

Attention and level of activity. Other studies have used the effort-related model to evaluate how the attentional strategy a person engages in is affected by the degree of strenuous activity (Razon et al., 2009; Tenenbaum & Connolly, 2008). The dissociative strategy is optimal for distracting attention away from what you are doing, like exercising, so that you do not perceive the elevated level of exertion. At low levels of intensity, attention can switch voluntarily between the two strategies. Ideally, a person would want to use the dissociative strategy. However, at high levels of exertion, attention can only use an associative strategy, thus making external stimuli irrelevant in distracting attention (Razon et al., 2009; Tenenbaum & Connolly, 2008).

More specifically, Tenenbaum and Connolly (2008) investigated how workload affected attention allocation in novice (less than one year of rowing experience) and experienced (more than one year of rowing experience) rowers. A maximum power output value was calculated for each rower using a rowing ergometer. Participants would increase their wattage in 20W increments each minute until they could not row anymore. This would serve as their baseline. The experimenter would calculate 30%, 50%, and 75% of their relative power outputs. That wattage would serve as moderate, strong, and very strong effort levels for each person. Ratings of perceived exertion (RPE) were measured by a 10-point category-ratio scale used to help the participant's report of perceived exertion with 0 meaning no exertion felt and 10 meaning a lot of exertion. The higher the RPE score, the higher the perceived level of exertion. Attention was measured by asking participants to rate their attention using a 10-point scale with 0 meaning they used external thoughts, daydreaming, or focusing on the environment and 10 meaning they had a lot of internal thoughts, and were focusing on how their body felt.

Tenenbaum and Connolly (2008) found evidence that as workload increased from 30% to 75%, attention shifted from an external focus to an internal focus, and perceived level of exertion increased as well. At a 30% workload level, rower's thoughts were distributed equally among associative and dissociative strategies, while at the 75% workload level, associative thoughts dominated most rowers' attention allocation. There were no significant differences in gender or level of experience for attention allocation. The only difference was that experienced rowers had a greater output at each level of intensity than novice rowers, which shows the benefits of having experience in the sport.

Delaying onset of associative strategy. Razon et al. (2009) looked at ways to delay the onset of the associative strategy by using auditory (i.e., music) and visual (i.e., eyes open or eyes closed) modalities. A handgrip-squeezing task was used to establish a maximum squeezing value. Participants would then perform at 30% of their maximum squeezing value in one of four conditions for as long as they could. In the control condition, participants performed the handgrip-squeezing task with no music and full vision (eyes open). In the occluded-only condition, participants performed the task with no music and were blindfolded. In the music only condition, participants listened to their choice of music and had full vision. In the occlusion and music condition, participants were blindfolded but were able to listen to music during the task. Attention and RPE were measured with the same self-report scales used by Tenenbaum and Connolly (2008) and were administered at 30 second intervals. When participants were allowed full vision while listening to their favorite music during the handgrip-squeezing task, their RPE was lower than participants that were blinded or had no music. The combined condition also prolonged the shift to the associative strategy so that those in the combined condition could use a dissociative strategy longer. However, towards the end of the task, participants in all the conditions shifted attention internally. This has applications for exercise in that distracting attention using different modalities can defer the onset of an associative strategy and therefore allow people to focus attention elsewhere and not on the physical effort being exerted.

The purpose of Schucker et al.'s (2009) study was to investigate if the focus of attention could have an influence on running economy (oxygen consumption at a set running speed). A high running economy is when there is a low oxygen consumption at a set sub-maximum running speed. Participants consisted of 24 trained runners that attended two sessions with 7 days in between sessions. The first session involved calculating each participant's maximum oxygen consumption on a treadmill that was used to compute the target speed (75% of VO_2 max, i.e., maximum oxygen consumption or a person's aerobic capacity). In order to do this, participants ran on a treadmill starting at 8 km/h and speed was increased every 3 minutes by 2 km/h until participants became exhausted. In the second session, participants ran on a treadmill at their target speed for 30 minutes. Oxygen was measured using a breath-by-breathe procedure, as well as respiratory rate, respiratory minute volume, ventilation rate, and respiratory quotient during the entire 30 minutes. Heart rate and blood lactate concentration from the earlobe were taken every 10 minutes during a 90-second break. Every 10 minutes participants were required to change their focus of attention. The two internal focuses of attention were the running movement condition (i.e., required to concentrate on running movement) and the breathing condition (i.e., instructed to focus on breathing). The external focus of attention was the surroundings condition (i.e., focus on the film clip in front of them which showed a running course from a perspective of a runner running at 12 km/h). Participants were randomly assigned to 1 of 6 possible orders. Each was given a questionnaire at the end asking about where they concentrated attention in each condition and how they felt about each condition (i.e., hard or easy).

The results of Schuker et al.'s (2009) experiment showed that for oxygen consumption, participants in the external focus condition had the lowest oxygen consumption followed by the running movement condition (internal focus) and the breathing condition (internal focus). Participants also rated the surroundings condition (external focus) as the easiest condition. This study shows that when a runner focuses externally, as opposed to internally, the runner exhibits a better running economy and the run seems easier (Schuker et al., 2009).

Distraction and Exercise

Several studies have looked at how distraction can increase exercise duration and intensity (Annessi, 2001; Bourdeaudhuij et al., 2002; Brownley, McMurray, & Hackney, 1995).

Auditory Distracters

Music has been found to be an effective distracter in decreasing perceived level of exertion. Brownley et al. (1995) examined trained and untrained runners in three music conditions (no music, sedative music, and fast music) during treadmill running at varying intensity levels. Participants VO_2 max (i.e., maximum oxygen consumption or a person's aerobic capacity) was determined by having them utilize a cycling machine and pedal at 50 rpm. This workload was increased every three minutes until the participant's heart rate reached 70% of an age-adjusted maximum. The VO_2 max was then used to calculate the equivalents in treadmill speeds to represent low, moderate, and high intensities. The sedative music condition was based off of stress management selections while the fast music condition utilized pop, rock, and music sound tracks that had a tempo range of 154-162 beats/min. All participants were given the same sedative music but they had a choice between two fast music tapes. Each participant was involved in 3 discontinuous walk/run protocols that were 10 minutes each and progressed in stages of low, moderate, and high intensity. The exhaustion stage consisted of increasing the speed by 2% every 2 minutes until the participant decided he or she could no longer continue. RPE (rating of perceived exertion) and a feeling scale (assessed affective dimension of the person's exercise experience) were administered just prior to the culmination of each stage. The RPE scale utilized was the same one that Razon et al. (2009) and Tenenbaum and Connolly (2008) used. Each participant experienced all three trials that were conducted at the same time of day (mid-day hours to control for circadian cortisol patterns) within a one week period.

Brownley et al.'s (1995) results demonstrated that untrained runners exhibited more positive affect while exercising to fast, upbeat music, while trained runners reported more negative affect during the fast music condition. Trained runners reported the most positive affect during the no music condition. Untrained runners rated perceived exertion lowest during fast, upbeat music, while trained runners rated it lowest during the no music condition. This suggests that fast music can be effective in decreasing perceived level of exertion, at least in untrained individuals. These results could potentially be attributed to music distracting attention away from the task so that untrained runners were better able to cope with fatigue (Brownley et al., 1995). The problem with this study is that although the researchers tried to allow participants to have preference in music selection, they only did so for the fast-beat music condition which may confound the results. It is possible that if the runners could choose which sedative music they enjoyed, they may have exhibited more positive affect.

Brownley et al. (1995) also found no evidence that music affected how much longer runners ran in the exhaustion stage. There was no difference in total time between the no music, sedative music, and fast music conditions. This supports the effort-related model which suggests that attention can be diverted using a distraction. However, there is a point where the mind can not switch back and forth from the associative strategy to the dissociative strategy and is therefore stuck in the associative strategy. At this point, distracters (like music) are ineffective in shifting attention. As a person nears exhaustion, he or she remains set in the associative strategy, which could be the reason that music had no effect in the exhaustion stage (Razon et al., 2009).

Edworthy and Waring (2006) investigated the effects of music loudness and tempo on exercise. There were five conditions of music: fast/loud, fast/quiet, slow/loud, slow/quiet, or no music. Headphones were worn in all conditions but in the no music condition, nothing played. In each of the music conditions, a song played for 2.5 minutes and was looped so that it could play for the entire exercise period. Participants were allowed to warm up and then the music was slowly introduced until it reached the correct tempo and loudness for that condition. It was played for 10 minutes then the music turned off and the participant continued running for a cool down period. Participants were told that they would be participating in 5 separate conditions and that they were required to run or walk at a comfortable pace for 10 minutes. After five minutes and at the end of 10 minutes participants had to respond to a ratings of perceived exertion (RPE) scale and a feelings scale.

The results showed that those in the fast and loud music condition had higher treadmill speeds compared to the slow and quiet music condition. Overall, the fast music conditions produced faster treadmill speeds than the slower music conditions but the fast and loud music condition was better than the fast and quieter condition. Participants' heart rate was higher in the fast condition than in the slow condition. Overall, RPE increased from the 5-minute ratings to the 10-minute ratings. Participants reported more positive affect in all of the music conditions but not in the no music condition. This study shows that fast and loud music can increase a person's level of exertion when running on a treadmill and enjoyment (Edworthy & Waring, 2006).

Brodsky (2002) examined the effects of music tempo on driving. Twenty students listened to either slow-tempo, medium-tempo, or fast-tempo background music or no music while under simulated driving conditions. Participants drove an eight lap course while each of the conditions was presented to them at different points in the course. The experimenter recorded the number of virtual traffic violations (e.g., collisions, lane crossings, and disregarded red traffic-lights), heart rate and driving performance (i.e., miles per hour) during each condition. The results showed that as music tempo increased, driving speed and traffic violations increased. The researcher suggested that due to limited attentional space, the fast-tempo music acted as a distraction from driving.

Bourdeaudhuij et al. (2002) examined how using music as a distraction affected treadmill running in obese children and adolescents. All of the participants were in a multi-component treatment program that tried to teach them to eat healthy and increase physical activity. To determine running time to exhaustion for each participant, an incremental treadmill protocol was used. Participants would start at 3 km/h and workload would increase every 1.5 minutes by 1 km/h until the maximum individual workload was attained. This was used to calculate the speed for each session. Each participant performed a treadmill test in four different sessions. The first two sessions were administered at the beginning of the treatment program and the second two sessions were done at the end of treatment. One session at the beginning and one session at the end of the treatment involved a distraction. Sessions were scheduled at the same time of day and order effects were controlled for by having half of the participants start with a session with distraction while the other half started without a distraction. All participants were asked to bring their favorite music to listen to during the distraction condition. All self-reports were completed directly after cooling down. Participants reported on 20 bodily sensations using a five-point scale ranging from 0 (not) and 5 (very much). These sensations included cardiac, arousal/anxiety, gastro-intestinal, dizziness, and pain. Participants also rated their experience of the experiment on a similar five-point scale that asked if they liked the music, how much they listened to the music during the test, how pleasant they found the test while listening to music, how much longer could they have ran while listening to music, how much attention was given to body sensations, and how often they thought about being able to carry on the test. The questions regarding music were only asked during the music condition. Heart-rate was monitored using a portable cardio tachometer, and VO_2 and respiratory exchange ratio was configured by measuring oxygen and carbon dioxide concentrations in expired air.

Bourdeaudhuij et al. (2002) showed that those in the music condition not only ran longer, but it took them longer to perceive bodily cues that would influence them to decide to stop. Participants reported less attention to bodily sensations during the music condition compared to the no music condition. Participants also ran 40 seconds longer in the distraction condition and had a higher peak heart rate, respiratory exchange ratio, and VO_2 peak than in the no distraction condition. During the no music condition, participants reported more thoughts concerned about being able to carry out the task. The findings are consistent with Tenenbaum and Connolly's (2008) and Razon et al.'s (2009) findings on using the dissociative strategy to distract attention away from the task. Music provided the external cue so that attention could be directed at that instead of the physical activity. Bourdeaudhuij et al.'s (2002) findings also supports the idea of the associative strategy impacting the choice of a person to stop exercising because it causes a person to focus on the cues the body is giving off. This was evident in that participants in the no music condition reported paying more attention to bodily sensations and they ended up running for less time than in the music condition. As in Razon et al.'s (2009) research, focused shifted to an inflexible associative strategy towards the end of treadmill running which probably caused participants to stop exercising.

Visual Distracters

Another distracter that has received little research attention is whether viewing a screen while exercising can provide a similar level of distraction as music can. Annesi and Mazas (1997) looked at how virtual reality-enhanced bicycles could increase exercise in new fitness center members. A virtual reality-enhance bicycle is a bicycle that has a screen in front of it that simulates riding a bike outdoors and shows the effects in real time. Three bicycle groups (upright bicycle, recumbent bicycle, and virtual reality-enhanced exercise bicycle) were looked at over 14 weeks to assess adherence to the suggested recommendation of exercising 3 or more sessions for 20 to 30 minutes a week. Participants who used the virtual reality-enhanced bicycles had 83% adherence compared to the upright bicycle group that had 57% adherence and the recumbent bicycle group that had 62% adherence. This shows that the virtual reality-enhanced bicycle increased commitment to the exercise recommendations.

Annesi (2001) investigated how music, television, or a combined entertainment system could increase self-motivation, adherence, and physical output in exercising of new fitness members. The music group used an AM/FM stereo cassette player while exercising. The television group watched one of four pre-set channels while exercising. The combined entertainment group was allowed to watch television and use an AM/FM radio and audio tapes.

They were allowed to choose among 62 channels to watch and could change them at any time. Participants were randomly assigned to the different conditions and were allowed to choose from any cardiovascular machine available. There were no significant differences found among the groups on distraction measures, however the combined entertainment group exercised for significantly longer and had a lower dropout rate compared to the other groups. The combined entertainment group also improved significantly on high maximum volume of oxygen uptake from the beginning to the end of the study. This supports Annesi and Mazas (1997) study on virtual reality-enhanced exercise equipment, because the combined entertainment system resembled many of the features of virtual reality that divert attention. In Annesi (2001), the television, music, and control group did not differ significantly in length of sessions, cardio-respiratory change, or adherence. It should be noted, however, that the television group was not allowed to choose the channel they watched. While the combined group was able to choose which of 62 channels to watch on the television, the television group was required to watch whichever channel was already set on the television. Therefore, part of the reason there was no difference between the television group and the control group could be because the television group was not interested in paying attention to the television in front of them, which would negate the influence of the external stimuli. This also could be the reason why significant differences were found in the combined entertainment group because they were allowed choice of what to watch. The interest the participant has in what they are watching could influence the effectiveness of the distracter. Green et al. (2008) showed how increasing preference for a task can increase enjoyment of the task. Enjoyment and preference for a task have been correlated with increased levels of physical activity (Salmon et al., 2003). The proposed study will allow participants to choose which channel they want to watch in order to increase interest in external focus.

Another problem in Annesi's (2001) study which could account for the lack of significant differences among the television group and control group was that participants could choose whichever cardiovascular machine they wanted. Depending if they choose a 'harder' or 'easier' machine, could affect their adherence to exercise as well as how long and at what intensity they exercised at (Tenenbaum & Connolly, 2008). Time spent on a bicycle is not equivalent to the same amount of time spent running on a treadmill. Participants in Annesi's (2001) study also did not necessarily have to choose the same type of exercise equipment each time. If they choose easier equipment in the first weeks of the study but harder equipment in later weeks, the absence of increase in exercise duration or intensity throughout the study could be due to participants choosing different equipment. This could especially be true for the television group because they may have chosen equipment based on what television channel was set in front of that equipment. The proposed study will control for the differences in cardiovascular equipment by requiring participants to use a treadmill for running.

Current Study

The study serves to systematically replicate Annesi's (2001) study examining how using an entertainment system while exercising can affect physical output. The current study only used television as a distracter and controlled for factors such as choice of television channel and exercise equipment. Allowing participants to choose which television channel to watch based on preference is important for providing an effective external distraction, as was shown in Bourdeaudhuij et al. (2002). A treadmill was the only cardiovascular machine used in order to control for the differences in difficulty of different exercise equipment. Controlling for exercise equipment is necessary because time spent on a bicycle is not equivalent to the same amount of time spent running on a treadmill. Choosing more difficult equipment can affect how long and at what intensity a person exercises at (Tenenbaum & Connolly, 2008).

Forty-two adults (20 men and 22 women) from a local Rochester, N.Y. fitness center were recruited to participate. Participants were screened to determine if they were untrained or trained runners. Only untrained runners were used in data collection due to differences found between trained and untrained runners in Brownley et al. (1995), which suggested that music negatively affected trained runners but positively affected untrained runners. There were no expected differences in ability to allocate attention based on gender (Tenenbaum & Connolly, 2008).

Because of possible issues of demand characteristics and reactivity, a between-subjects design was used to compare two conditions: television versus no television. To increase reliability of data, there were three sessions for each condition. Length of exercise was measured by looking at the distance a participant walked/ran on the treadmill in 15 minutes. Distance as a measure of exercise is commonly used (Bourdeaudhuij et al., 2002; Edworthy & Waring, 2006). Attention allocation was measured by participants rating their focus on internal or external cues multiple times while exercising and answering a question regarding their thoughts while exercising (Baden, McLean, Tucker, Noakes, & Gibson, 2005). The television provided an external stimulus that allowed participants to maintain a dissociative strategy for significantly longer than the no television condition. Due to previous research suggesting that distractors tend to speed up the passage of time, time perception was measured by asking participants how long they thought they had been running at the end of each session (Tobin & Grondin, 2009). Due to previous research suggesting that preference is a factor in the effectiveness of a distracter

(Bourdeaudhuij et al., 2002), participants in the television condition were asked at the end of each session if they enjoyed the television channel they choose to watch. Also, participants in both conditions were asked if they enjoyed walking/running on the treadmill.

As the major hypothesis, it was expected that when viewing the television, participants would walk/run farther on a treadmill in a set period of time than participants who did not watch the television. Bourdeaudhuij et al. (2002), Brownley et al. (1995), and Edworthy and Waring (2006) have shown how music can be used as an effective distracter while exercising, while Annesi (2001) showed that a combination of television and music can be an effective distracter.

It was expected that participants would utilize a dissociative strategy for significantly longer in the television condition than participants who did not view the television. Further, it was expected that participants would report more external thoughts in the television condition than participants in the no television condition. According to the effort-related model of attention, distraction can shift attention from focusing on internal cues (i.e., associative strategy) to focusing on external cues (i.e., dissociative strategy) (Razon et al., 2009). Participants did not run to exhaustion because Razon et al. (2009) and Tenenbaum and Connolly (2008) demonstrated that at high levels of exertion, distractions are ineffective in allowing a person to shift attention to external cues.

Participants in the television condition were expected to rate the amount of time they were on the treadmill significantly less than the participants in the no television condition. Tobin and Grondin (2009) found evidence that preference for a task has an effect on time perception and that distractions make time seem to go by quicker.

Participants in the television condition were expected to rate the enjoyment of their running experience as significantly more than participants in the no television condition. Russell et al. (2003) concluded that it may be the enjoyment of the content of the distraction that matters for increasing exercise and not just whether a distraction is present or not.

Method

Participants

A total of 42 fitness center members (20 men and 22 women) from Rochester Fitness Center, a small fitness center (approximately 375 active members) in Rochester, N.Y., were recruited to participate in the study through word of mouth (i.e., the experimenter walked around the gym asking everyone in the gym to participate) and flyers posted around the fitness center (i.e., see Appendix A & B for recruitment script and flyer, respectively). All participants were healthy and able to exercise on fitness equipment, as determined by an adapted health questionnaire, the Physical Activity Readiness Questionnaire and You (PAR-Q and You; American College of Sports Medicine, 1997). If a member selected 'yes' to any of the questions then he or she was excluded from the study (i.e., see Appendix C for the PAR-Q). Participants ranged in age from 18 to 55 years old (average age of 44 years), were of various ethnicities, and various heights and weights. Only untrained runners were eligible to participate (Brownley et al., 1995), as determined by responses on the screening questionnaire (see Appendix D).

Materials

The PAR-Q (i.e., see Appendix C) is a self-screening questionnaire used to determine safety and possible risks of exercising for an individual based upon his or her answers to specific health history questions. The American College of Medicine's (1997) version has been revised by the researcher by taking out introductory information regarding having to obtain a doctor's permission to exercise if a participant circles 'yes' to any of the health questions. For purposes of this study, if a person circled 'yes' to any question, the person was excluded from participation.

The Screening Questionnaire (Casilio, 2011; see Appendix D) is a questionnaire that requests the following information: gender, age, how often a person runs each week and for how long and how far a person runs each time. Gender and age was used to match participants prior to randomly assigning to conditions. The distance per week a person runs and how often the person runs a week was used to determine if the person is a trained or untrained runner. A member who ran less than 30 miles per week or ran less than 3 times per week at at least 20 minutes per session was considered an untrained runner (Blanchard, Rodgers, & Gauvin, 2004; Schucker et al., 2009).

Baden et al.'s (2005) Associative Thought Scale was used to assess the percentage of associative thought a participant experienced while running on the treadmill (i.e., see Appendix E for verbal script). Associative thoughts are internal thoughts a person has that focus on bodily symptoms and how the body is reacting. When the experimenter asked a participant what percentage of the participant's thoughts is associative at the time, the participant responded with a number 0 to 100. The scale ranges from 0 to 100 with 100 representing only associative thoughts and 0 representing no associative thought (i.e., no focus on bodily symptoms and how the body is reacting). Dissociative thoughts are thoughts that are directed at external factors and serve as a distraction. The remainder of the thought score that is not associative thought was a measure of dissociative thought. The results of Baden et al. (2005) showed that association and dissociation existed along a continuum and that the one-item questionnaire can be used as an effective way to measure a person's attentional-focus. The scale has been found to have sound ecological validity (Tenenbaum, Kamata, & Hayashi, 2007). Razon et al. (2009) utilized a similar one-item measure, however their scale only ranged from 0 to 10 with 0 representing purely dissociative thought and 10 representing purely associative thought. A score of 5 represented a shift between attentional focus.

To measure time perception, the participants were asked, "How long do you think you've been walking/running on the treadmill?" (see Appendix F and G) This information was used to assess if being distracted while walking/running affects how the participant perceives how long he or she has exercised. Tobin and Grondin (2009) showed that when participants were distracted by a task, time was rated as going by faster.

There were two questions asked to assess preference. The first question was asked of all participants to determine if participants in the television group enjoyed the running experience more than participants in the no television group (see Appendix F and G). Participants were asked, "On a scale from 0 to 10 with 0 meaning not at all and 10 meaning a lot, please circle how much you enjoyed walking/running on the treadmill?" The second question regarding preference was only asked of participants in the television group to serve as a manipulation check to determine if those participants enjoyed the television show they were watching (see Appendix G). Participants were asked, "On a scale from 0 to 10 with 0 meaning not at all and 10 meaning a lot, please circle how much you enjoyed the television show you were watching while you walked/ran on the treadmill?" This is important because having preference for the television show the participant is watching can affect how effective the television distraction is on increasing exercise (Green et al., 2008; Lancioni et al., 2004; Salmon et al., 2003).

To confirm the construct validity of the Associative Thought Scale, a manipulation check was used to determine if attending to the television served as a distraction, maintaining participants' thoughts in the dissociative state (See Appendix H). This was only done at the end of the third session to minimize reactivity and pretest sensitization.

Apparatus

Participants watched a television (a Sansui 40" Class LCD 1080p HDTV mounted to the ceiling) that was approximately nine and a half feet above and eight feet away from the front of the treadmill. The television had closed captioning for the participants to read. Participants were able to choose from over 100 channels from Time Warner cable. They were not allowed to select a channel playing the news since that may allow them to see how much time is passing.

The treadmill was a Star Trac TR 4500. The display panel that shows a participant's distance and time was covered with a white towel. Only the speed was displayed.

A stopwatch was used by the experimenter to keep track of time.

Procedure

Participants were recruited through flyers and by the experimenter walking around the gym asking members (i.e., see Appendix A and B). Once informed consent was obtained (i.e., see Appendix I), participants were given a screening questionnaire to determine the participant's gender, age, height, weight, and whether a participant was an untrained runner or not (i.e., see Appendix D). Participants filled out the PAR-Q and were asked whether or not they would be willing to be contacted for future sessions (see Appendix C and J).

After the PAR-Q responses were examined and ineligible people were removed because they circled 'yes' to a question, and after those who did not want to be contacted were removed, remaining participants were contacted (see Appendix K). A between-subjects experimental design was used. Participants were first matched on age and gender and then randomly assigned to one of two conditions (television or no television). Participants were matched on age because age has been found to be related to distance, as shown in Randsdell, Vener, and Huberty (2009) that as age increases, performance in running declines. Participants were also matched on gender because Randsell et al. (2009) showed a gender difference in running with men running faster than women.

Participants assigned to the television group were instructed to walk/run on a treadmill while focusing on watching a television show (i.e., see Appendix L). Participants indicated what channel they wanted to watch before the experiment began and were told they could not watch the news. The experimenter changed the channel to what the participant chose prior to beginning the experiment. The television remained on that channel for the entire session. Participants were able to pick a different channel or the same channel on the next session.

The experimenter stood three feet to the side of the treadmill and monitored the participants to make sure that they were looking at the television. If a participant looked away from the television for longer than 10 seconds, which was kept track of by the experimenter, the experimenter gave a verbal prompt (i.e., "Please remain focused on the television.") If the participant looked away from the television more than two times that was longer than 10 seconds, the participant's data was excluded from the study.

In the no television condition, participants were instructed to walk/run on the treadmill and did not receive any entertainment means including television, music, or radio. They were told to look straight forward and stare (see Appendix M). The experimenter monitored the participants by standing three feet to the side of the treadmill to make sure they were not using any entertainment device and were looking forward. If a participant looked in a different direction than forward for longer than 10 seconds, the experimenter gave a verbal prompt (i.e., "Please look forward while walking/running"). If the participant looked in a different direction than forward more than two times for longer than 10 seconds, the participant's data was excluded from the study. If the participant used any entertainment device, the experimenter said to the participant, "You cannot use any entertainment devices while you are walking/running." If the participant continued to use an entertainment device, his or her data was excluded.

For both conditions, participants saw a walking track, weight machines, and an aerobics room in the background. All participants in both conditions were instructed to run/walk at a pace they felt comfortable at on the treadmill. They remained unaware of how long they were walking/running throughout the experiment. The display panel was covered so participants could not see how long they had walked/ran or how far they had walked/ran. The experimenter instructed them on how to use the treadmill and to remove all watches, cell-phones, and other electronic devices before beginning (i.e., see Appendix L and M for instructions read to participants in each group). Participants were allowed to have up to a 5 minute warm-up period. During this time period, the participant started the treadmill and began to increase his or her speed to what felt comfortable for him or her. Participants then signaled to the experimenter that they were ready to begin the experimental session. The experimenter recorded the distance the participant started at, covered up the participant's panel so that the participant was unaware of distance and time that had passed, and began to time the participant for 15 minutes. While on the treadmill, participants were able to adjust their speed when they wanted to by pressing the increase or decrease speed buttons. These options were located directly in front of the participant on the treadmill.

On the 2, 5, 8, 10, 13, and 15 minute marks, the experimenter verbally administered the Association Thought Scale (i.e., see Appendix E) and the participant responded with a number 0 through 100. The experimenter recorded the participant's response and the participant's speed at the time of the response. After 15 minutes had elapsed, the experimenter instructed the participant to have a cool down period of up to 5 minutes where the participant decreased his or her speed to 0 mph and proceeded to get off the treadmill. Immediately after the participant was off of the treadmill, the participant was given a questionnaire with a time perception question and a preference question. The television group also responded to a second preference question (see Appendix G). At the end of the session, participants received a bottle of water as reimbursement and were verbally asked if they would like to continue the study and schedule the next session. They were told that it is important for them not to talk about the study to anyone (see Appendix N).

Each participant was exposed to three sessions of either the television or no television condition that was performed on different days at approximately the same time, plus or minus two hours. At the end of all 3 sessions and all data was collected, participants were asked what they were thinking while they were walking/running (See Appendix H). Finally, all were verbally debriefed (see Appendix O) and entered into a lottery for a drawing (see Appendix P).

Results

Data for exercise were collected each session by the experimenter, by recording the start distance (after warm up), the end distance (after 15 minutes), the time perception response, the preference response, responses to the Associative Thought Scale at minutes 2, 5, 8, 10, 13, and 15, and speed at the 2, 5, 8 10, 13, and 15 minute marks. Each participant experienced three sessions in his or her assigned condition (television versus no television) resulting in three sets of data (see Tables 1 through 5 for raw data). From the data collected, the dependent variables were: distance (calculated by subtracting the start distance from the end distance), associative/dissociative thought response and speed (for each of six times), time perception score, preference score, and preference score for television condition.

To examine the effects of session (i.e., if there were differences on each dependent variable across the 3 sessions), a one-way repeated measures MANOVA was performed. It was expected that there would not be a significant effect for session. With the exception of the distance variable [$F(2,82) = 3.52$, $p = .03$], no significant effect of session was obtained (see Table 6 for results for each variable). Therefore, for all further analyses, the average of each variable across the 3 sessions was used (see Tables 7 and 8 for averages across session).

To examine the effects of condition (i.e., television viewing) on each variable a one-way between-subjects MANOVA was performed. The between-subjects independent variable was condition (TV or no TV) and the dependent variables were distance, time perception, preference response, Associative Thought Scale response at each of the minute marks (i.e., 2, 5, 8, 10, 13, and 15), and speed at each of the minute marks (i.e., 2, 5, 8, 10, 13, and 15). It was expected that there would be a significant effect of television viewing on distance, in that there would be a longer average distance walked/run in the television group compared to the no television group. The hypothesis was not supported because no significant effect of condition was found on distance, $F(1,40) = 1.57$, $p =.22$. It was expected that there would be a significant effect of television viewing on time perception, in that the television group would rate how long they thought they had been running as less than the no television group. The hypothesis was not supported because no significant difference was found between groups on the time perception score, $F(1,40) =.38$, $p=.54$. It was also expected that there would be a significant effect of television viewing on preference, in that the television group would rate the walking/running experience as more enjoyable than the no television group. A significant difference was found between groups on enjoyment, in that the television group rated the walking/running experience as more enjoyable than the no television group, $F(1,40) = 9.56$, $p = .00$. It was also expected that there would be a significant effect of television on ATS response at each of the six minute marks. With the exception of the ATS response variable taken at the 2-minute mark [$F(1,40) = 1.09$, $p=.30$], all of the ATS response variables were significant (see Table 9). It was also expected that there would be a significant main effect of television on ATS speed at each of the six minute marks. The hypothesis was not supported because no significant difference was found (see Table 9 for results that were not significant).

To examine the effects of condition and minute mark on ATS scores, a 2x6 mixed-MANOVA was completed. The between-subject independent variable was condition (TV or no TV) and the repeated measures independent variable was minute mark (2, 5, 8, 10, 13, and 15). The dependent variables were ATS responses. The main effect of television viewing on ATS responses scores was significant, $F(1,40) = 10.13$, $p=.00$. The main effect of minute mark on ATS responses was significant, $F(5,200) = 11.08$, $p=.00$. There was a significant interaction between TV viewing, and minute mark on ATS response, $F(1,40) = 4.90$, $p=.00$ (see Figure 1). In addition, a paired sampled t-test compared the ATS responses of the 2-minute and 15-minute marks for the no television condition and a significant difference was found, $t(20) = -5.52$, $p= .00$ (see Table 10). A paired sampled t-test compared the ATS responses of the 2-minute and 15-minute marks for the television condition and no significant difference was found, $t(20) = -.81$, $p= .43$ (see Table 10).

To compare the percentage of associative thought between the no television and television conditions, a chi-square analysis was performed. No significant difference was found, $x^2(10) = 8.19$, $p=.61$.

In addition, a manipulation check on the television group was used to assess if the television group enjoyed the television show they watched. The television group's average response of enjoyment of the television show was 7 on a scale from 0 to 10, 0 meaning the participant did not enjoy the television show at all and 10 meaning the participant enjoyed the television show.

Discussion

Over 31% of the world's population is not physically active and 3.2 million deaths per year are associated with physical inactivity (WHO, 2011). The purpose of the current study was to address the obesity epidemic by examining if watching a television while walking or running would increase exercise.

The major hypothesis, which was not supported, was that participants in the television condition would walk/run farther than participants in the no television condition. The current finding is consistent with Annesi's (2001) findings of no difference between the television and control group. One possible explanation for the finding of no effect of television viewing on distanced walked/ran is that all the sessions were 15 minutes long, which limited the range on distance walked/ran. A restricted range of exercisers (i.e., untrained runners) may have also limited the range of distances participants walked/ran. A third reason is that participants may have been aware of the hypothesis by talking with other members, though this risk was minimized.

It was also expected that participants would utilize a dissociative strategy for significantly longer in the television condition than participants who did not view the television. Further, it was predicted that participants would report more external thoughts in the television condition than participants in the no television condition. The hypothesis was supported in that the television group experienced more dissociative thought at each of the minute marks (i.e., 2, 5, 8, 10, 13, and 15), except the 2-minute mark. This finding supports Brewer and Karoly's (1989) study that found that using a dissociative strategy helped people cope with pain. Focusing on the television helped participants to not realize the pain they were experiencing while exercising. The television effectively distracted the participant's attention away from internal focusing and feelings of discomfort to the external stimulus.

Participants in the television condition were expected to rate the amount of time they were on the treadmill significantly less than the participants in the no television condition. The hypothesis was not supported because no significant difference was found between groups on the time perception score. This result is likely due to the time limit placed on each session creating a restricted range of possible times. Participants were told that they would be on the treadmill for less than 20 minutes and during each session the participant walked/ran for the same amount of time (i.e., 15 minutes).

Participants in the television condition were expected to rate the enjoyment of their running experience as significantly more than participants in the no television condition. This hypothesis was supported because a significant difference was found between groups on the enjoyment scores. This result is consistent with Green et al.'s (2008) study that showed that by increasing preference for the task, enjoyment for the task increased. The television group was able to choose which channel they wanted to watch which increased preference for the task. In addition, a manipulation check on the television group was used to assess that the television group really did enjoy the television show they watched. This result supports Lancioni et al.'s (2004) study that concluded that increasing preference can increase happiness when being physically active.

Limitations and further research

The major limitation of this experiment was the restriction of time to 15 minutes each session. Since television viewing increased dissociative thought and enjoyment, it suggests that if the time of the sessions was not limited, television viewing may have increased distance walked/ran and decreased perception of time spent exercising. Future research should examine the effects of television viewing on distance without limiting the time a person can walk/run on the treadmill. It is possible that no significant results were obtained for distance due to the time constraint placed on the participants.

This research is also limited in external validity in that exercising on the treadmill was the only machine utilized. Future research could examine if television has the same effect on thoughts and exercise while using other cardiovascular equipment. There are also practical limitations of the fitness center. For example, one of the problems is commercials in the television programs. Many of the participants reported that they found the commercials boring and that there were too many of them. If participants were able to bring in a favorite movie to watch this problem could be eliminated, but the fitness center did not have the capabilities to play movies brought from home. Also, a more longitudinal study may be necessary to look at the long term effects of watching television while exercising to see if always having the television present while exercising will increase exercising habits, possibly motivating a person to go to the gym more.

Implication of findings

Over the last twenty years the obesity rate in the United States has increased significantly. In 2009, Colorado and the District of Columbia were the only places that had a less than 20% obesity prevalence rate, while Tennessee, Alabama, Oregon, Arkansas, Missouri, Louisiana, Kentucky, Oklahoma, and West Virginia had prevalence rates of over 30% (CDC, 2010). Due to the health risks associated with obesity, it is important to find ways to get people to increase exercise (Friedenreich et al., 2010). This research helps find a way to distract people's attention away from the pains of exercising. The results show how behavior is different from thought. Although participants did not differ in the amount of distance walked/ran, those in the television condition were able to think less about their body and the workout, as well as enjoy the workout more. Having an enjoyable experience may motivate people to exercise more often instead of a longer distance. With this knowledge, more televisions should be placed in fitness centers and fitness trainers should encourage people to use them when exercising. The hope is that people will start exercising more and the obesity rate will decrease along with the many health problems associated with it.

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Table 1

Raw Data for each participant's distance, time perception response, and preference response for session 1, 2, and 3.

		Distance			Time			Preference		
Part#	Cond	1	2	3	1	2	3	1	2	3
143	1	0.85	0.83	0.83	15	14	15	8	5	5
144	1	1.42	1.2	1.01	15	12	15	7	6	6
10	1	1.05	1.09	1.11	15	20	15	8	7	6
68	1	1.07	1.07	1.02	15	10	15	10	10	10
142	2	1.27	1.26	1.27	17	10	15	8	8	9
110	2	1.11	1.07	1.05	20	15	15	2	2	3
26	2	0.88	0.82	0.8	15	15	20	5	3	3
145	2	0.73	0.78	0.8	10	15	15	7	10	9
80	1	1.05	1.07	1.1	15	20	15	6	8	8
152	2	0.85	0.87	0.8	15	15	12	2	3	9
111	1	0.9	0.87	0.81	20	20	15	7	8	9
153	1	0.83	0.76	0.81	20	25	19	6	5	6
132	2	0.83	0.85	0.8	20	15	20	7	5	5
157	2	0.84	0.86	0.92	15	12	12	8	8	8
5	1	0.92	0.91	0.89	15	12	13	9	10	9
6	1	1.01	1.02	1.01	15	17	15	10	10	10
134	2	0.91	0.77	0.81	15	14	14	5	1	1
89	1	1.89	1.67	1.74	17	15	10	8	8	8
135	1	0.89	1.03	0.85	15	20	16	8	8	6
81	1	0.99	1.15	1.08	15	15	12	10	8	8
4	1	1.14	1.16	1.16	10	12	12	10	10	10
85	1	0.99	1.06	1.07	20	20	15	5	6	7
15	1	0.94	0.99	0.89	10	15	15	5	7	5
30	2	1.11	1.16	1.23	15	15	15	4	7	5
130	2	0.88	0.92	0.83	15	12	15	5	9	8
76	2	0.85	0.85	0.94	15	20	15	5	8	9
50	2	0.71	0.83	0.76	15	25	18	7	6	5
51	2	0.89	0.91	0.81	18	20	15	8	7	5
16	1	1.11	1.11	1.05	17	16	17	6	5	5
44	2	0.98	1.19	0.98	25	12	18	2	5	5
1	2	0.71	0.84	0.81	14	17	15	3	7	7
43	1	1.6	1.56	1.59	14	15	18	6	8	7
146	2	1.29	1.26	1.43	15	15	15	4	6	5
45	2	1.25	1.37	1.16	10	15	15	8	8	8
67	1	1.16	1.07	0.93	15	15	20	6	7	7

36	1	0.76	0.92	0.79	15	15	15	10	10	10
21	2	1.08	1.14	1.1	15	15	20	9	9	8
88	1	0.87	0.92		15	16		9	9	
66	2	1.27	1.31	1.38	15	20	18	5	9	6
133	2	0.87	0.89	0.81	20	21	20	4	5	4
47	2	0.97	0.95	0.89	15	18	17	2	3	6
77	1	1.07	1.17	1.02	14	20	15	5	7	5

Note. Distance = how far the participant walked or ran in 15 minutes; Time = the participant's time perception response; Preference = the participant's preference response on a scale from 0 to 10; Part#= the participant's assigned number; Cond= the condition the participant was in (TV=1 and NoTV=2); 1 = participant's data for session 1; 2 = participant's data for session 2; 3= participant's data for session 3.

Table 2

Raw Data for each participant's ATS-Response at the 2, 5, and 8 minute marks for sessions 1, 2, and 3.

		ATS2M			ATS5M			ATS8M		
Part#	Cond	1	2	3	1	2	3	1	2	3
143	1	60	75	50	50	50	55	100	50	40
144	1	0	10	10	20	20	10	5	40	30
10	1	50	75	20	50	75	25	60	70	25
68	1	50	40	20	40	40	20	40	30	20
142	2	90	90	80	90	90	80	80	90	90
110	2	25	10	10	40	20	20	52	30	25
26	2	50	50	70	80	70	37	70	70	65
145	2	70	50	50	75	55	60	75	60	65
80	1	30	10	15	50	15	15	45	15	10
152	2	0	10	10	10	23	20	20	37	30
111	1	10	20	25	25	40	25	25	60	50
153	1	100	100	100	98	90	92	88	88	85
132	2	15	5	10	20	18	25	30	20	32
157	2	80	85	75	85	90	80	90	90	80
5	1	70	70	50	70	30	40	50	20	20
6	1	40	10	20	80	20	20	80	40	10
134	2	10	70	60	20	80	70	50	75	70
89	1	20	50	50	20	50	40	30	30	60
135	1	10	5	20	10	10	25	15	25	25
81	1	50	50	30	70	30	20	30	20	30
4	1	10	50	50	10	50	50	15	10	50
85	1	70	30	70	50	60	70	30	70	70
15	1	50	50	0	20	10	30	30	10	70
30	2	50	30	20	65	40	40	65	65	70
130	2	90	50	85	40	60	87	85	65	90
76	2	50	30	60	70	30	70	90	50	70
50	2	50	60	30	60	60	40	65	75	50
51	2	30	20	50	40	40	60	50	50	65
16	1	25	0	0	25	10	0	50	10	30
44	2	10	10	10	15	10	12	15	10	30
1	2	25	50	50	30	65	65	50	55	75
43	1	20	25	25	30	15	25	30	15	20
146	2	40	50	50	50	60	60	50	100	90
45	2	50	50	30	20	50	50	40	70	75
67	1	50	40	40	70	30	30	70	50	20

36	1	0	50	10	0	20	10	10	0	10
21	2	90	100	90	27	90	50	95	30	90
88	1	98	85		55	60		65	65	
66	2	50	70	60	50	70	60	20	70	70
133	2	25	15	20	40	20	35	42	20	40
47	2	70	70	20	80	50	60	10	30	60
77	1	0	0	10	40	10	10	30	10	30

Note. ATS2M = Associative Thought Scale response at the 2-minute mark; ATS5M = Associative Thought Scale response at the 5-minute mark; ATS8M = Associative Thought Scale response at the 8-minute mark; Part#= the participant's assigned number; Cond= the condition the participant was in (TV=1 and NoTV=2); 1 = participant's data for session 1; 2 = participant's data for session 2; 3= participant's data for session 3.

Table 3

Raw Data for each participant's ATS-Response at the 10, 13, and 15 minute marks for sessions 1, 2, and 3.

		ATS10M			ATS13M			ATS15M		
Part#	Cond	1	2	3	1	2	3	1	2	3
143	1	90	80	30	70	70	35	50	50	25
144	1	20	10	30	10	40	10	10	60	20
10	1	65	65	25	65	65	30	70	70	30
68	1	40	30	20	40	25	20	45	25	20
142	2	90	80	80	90	80	80	80	80	80
110	2	60	35	30	65	40	35	70	55	40
26	2	50	80	37	30	80	80	30	80	80
145	2	90	65	70	100	70	75	100	70	75
80	1	40	20	20	40	20	40	50	30	40
152	2	25	40	30	40	60	40	30	60	45
111	1	50	75	75	30	70	75	50	80	75
153	1	88	85	85	90	90	90	90	90	90
132	2	50	25	40	55	30	50	55	40	65
157	2	90	90	85	90	90	80	80	90	90
5	1	20	10	0	10	0	0	10	0	10
6	1	50	50	20	50	50	20	60	30	30
134	2	35	70	60	45	65	60	30	50	60
89	1	20	25	40	30	30	30	60	30	20
135	1	20	25	20	25	35	30	45	35	35
81	1	20	20	30	20	10	20	30	10	30
4	1	25	50	50	15	50	50	20	50	50
85	1	30	70	75	50	75	75	50	75	50
15	1	20	30	70	10	60	60	30	70	70
30	2	50	70	65	50	50	70	80	70	80
130	2	90	75	90	93	85	92	92	87	94
76	2	90	50	80	90	70	85	93	85	90
50	2	65	75	60	70	50	65	70	80	75
51	2	50	60	70	60	65	70	65	70	75
16	1	55	0	30	55	0	35	30	10	20
44	2	25	12	25	25	10	15	30	15	10
1	2	27	75	80	50	45	80	50	60	75
43	1	20	20	35	30	25	30	35	15	20
146	2	60	100	90	80	90	100	90	90	100
45	2	50	75	80	70	80	80	85	95	90
67	1	60	40	30	60	40	35	50	20	30

36	1	20	0	10	20	10	20	30	12	20
21	2	90	80	90	50	75	60	75	100	80
88	1	75	84		65	90		85	96	
66	2	30	80	70	30	80	70	40	90	80
133	2	50	25	45	50	35	50	50	40	60
47	2	10	60	70	60	60	50	50	30	50
77	1	30	30	40	40	30	40	10	40	20

Note. ATS10M = Associative Thought Scale response at the 10-minute mark; ATS13M = Associative Thought Scale response at the 13-minute mark; ATS15M = Associative Thought Scale response at the 15-minute mark; Part# = the participant's assigned number; Cond= the condition the participant was in (TV=1 and NoTV=2); 1 = participant's data for session 1; 2 = participant's data for session 2; 3= participant's data for session 3.

Table 4

Raw Data for each participant's ATS-Speed at the 2, 5, and 8 minute marks for sessions 1, 2, and 3.

		ATS2M			ATS5M			ATS8M		
Part#	Cond	1	2	3	1	2	3	1	2	3
143	1	3.4	3.4	3.6	3.5	3.4	3.6	3.5	3.4	3.4
144	1	6	4	4	4.1	4	4.2	7	6	4.3
10	1	3.4	3.3	3.5	3.5	3.7	4.6	3.4	4	5
68	1	3.9	3.9	3.8	3.9	3.9	3.8	3.9	3.9	3.8
142	2	5.5	5.1	5.1	5.5	5.1	5.1	5.5	5.1	5.1
110	2	4	4	3.5	4	4	4	4	4.5	4
26	2	3.5	2.9	3	3.2	2.9	3	3.1	3.1	3
145	2	3	3	3	3	3	3	3	3	3
80	1	4	4	3.6	3.1	6.6	3.6	3.4	4.9	4
152	2	3.2	3	3	3.2	3	3	3.2	3.4	3
111	1	3.5	3.4	3.3	3.5	3.4	3.3	3.5	3.4	3.3
153	1	3.2	3	3.2	3.2	3	3.2	3.2	3	3.2
132	2	3	3	3	3.5	3.2	3	3.5	3.2	3
157	2	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.6
5	1	3.6	3.4	3.4	3.6	3.5	3.4	3.6	3.5	3.4
6	1	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
134	2	3.4	2.1	2.5	3.2	3	3.3	3.2	3	3.3
89	1	7	6	6.2	7	6.1	7	7	7	7
135	1	3	4	3.5	3.2	4	3.2	3.4	4	3.2
81	1	4	5	5	4	4.6	4.6	4	4.1	4.5
4	1	4.4	4.4	4.4	4.4	5.1	4.4	4.4	5.1	4.5
85	1	3	3.9	4.1	3	3.9	4.2	3	4.1	4.2
15	1	3.3	3.1	3.1	3.5	3.1	3.1	3.7	3.1	3.1
30	2	4.5	4.8	3.5	4.5	5	5	4.5	5	5.3
130	2	3.4	3.4	3.2	3.3	3.4	3.2	3.4	3.4	3.2
76	2	3.3	3.3	3	3.3	3.3	3	3.3	3.3	3
50	2	3.1	3	3	3.1	3	3	3.1	3	3
51	2	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.1
16	1	4.3	4.3	4	4.3	4.3	4	4.3	4.3	4
44	2	4	3.9	3.7	4	4.1	4	4	3.9	4
1	2	2.7	2.7	2.4	2.9	3.9	2.9	2.9	3.5	3.2
43	1	6.5	6.5	6.5	6.5	6.5	6.5	6.5	4	6.5
146	2	3.3	7.5	6.5	4	7.5	5.5	4	7.5	7
45	2	3.3	3.3	7.5	3.4	7.8	7.6	3.5	8.5	7.5
67	1	4	4	4	4	4	3.8	4	4	3.8

36	1	3	4	3.1	3	3.6	3.5	3	3.6	3.5
21	2	3.5	3	3.5	5.5	5	4	5.6	5	5
88	1	3.5	3.4		3.5	3.4		3.4	3.4	
66	2	5	5	5	5	5	5	5	5	5
133	2	3.5	3.4	5.5	3.5	3.6	5.5	3.5	3.6	3.6
47	2	3.5	3.4	3.2	3.6	3.6	3.5	3.6	3.6	3.5
77	1	3.4	3	3	4.2	4.5	4.5	4.5	4.5	4.5

Note. ATS2M = Associative Thought Scale speed at the 2-minute mark; ATS5M = Associative Thought Scale speed at the 5-minute mark; ATS8M = Associative Thought Scale speed at the 8-minute mark; Part# = the participant's assigned number; Cond= the condition the participant was in (TV=1 and NoTV=2); 1 = participant's data for session 1; 2 = participant's data for session 2; 3= participant's data for session 3.

Table 5

Raw Data for each participant's ATS-Speed at the 10, 13, and 15 minute marks for sessions 1, 2, and 3

		ATS10M			ATS13M			ATS15M		
Part#	Cond	1	2	3	1	2	3	1	2	3
143	1	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.3
144	1	4	4	4.3	8	7	4.3	4	7	4.3
10	1	3.4	4	5	3.4	5	3.5	5	5.1	3.6
68	1	3.9	3.9	3.8	3.9	3.9	3.8	3.9	3.9	3.8
142	2	5	5.1	5.1	5	5.1	5.1	5	5.1	5
110	2	5	4.5	4.5	5	4.5	5	5	5	5
26	2	3.1	2.8	3	3.1	3.5	3	3.1	3.1	3
145	2	3	3	3	3	3	3	3	3.1	3
80	1	6.8	4.1	3.8	4.4	4.1	4.3	4.4	3.8	4.4
152	2	3.2	3.4	3	3.2	3.4	3	3.2	3.4	3
111	1	3.5	3.4	3.3	3.5	3.4	3.3	3.5	3.4	3.3
153	1	3.2	3	3.2	3.2	3	3.2	3.2	3	3.2
132	2	3.5	3.2	3	3.5	3	3	3.5	3	3
157	2	3.4	3.4	3.6	3.4	3.4	3.6	3.5	3.4	3.4
5	1	3.6	3.5	3.4	3.6	3.5	3.5	3.6	3.5	3.5
6	1	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
134	2	5	3	3.3	5	3	3.3	3	3	3.3
89	1	7	7	7.2	7	7	7.3	7	7	7.3
135	1	3.2	4	3.2	3	4	3.5	3	4	3.5
81	1	4	4.1	4.5	4	4.6	4.8	4	4.8	4.5
4	1	5.1	5.1	5.1	4	5.1	4.5	4	4.4	4.1
85	1	3	4.1	4.2	3	4.1	4.2	3	4.1	4.2
15	1	3.7	3.1	3.1	3.8	3.1	3.1	3.8	4	3.1
30	2	4.5	5	5.3	3.8	4.1	5.3	3.8	4	5.3
130	2	3.3	3.6	3.2	3.3	3.6	3.2	3.3	3.6	3.2
76	2	3.3	3.3	3	3.3	3.3	3	3.3	3.3	3
50	2	3	3.1	3	3	3.1	3	3	3.1	3
51	2	3.4	3.4	3.1	3.4	3.4	3.1	3.4	3.4	3.1
16	1	4.3	4.3	4	4.3	4.3	4	4.3	4.3	4
44	2	4	4.2	3.8	4	3.7	3.5	4	4.1	3.6
1	2	3	3.3	3.5	3	3.3	3.5	3.3	3.3	3.5
43	1	4	6.9	4	6.5	6.9	6.5	6.5	4	6.5
146	2	4	3	4	8	3	6	8	7	7
45	2	3.5	7.4	3.5	8.5	7.9	3.5	8.8	8.5	7
67	1	4	4	3.8	4	4	3.8	4	4	3.8

36	1	3	3.6	3.5	3	3.6	3.5	3	3.6	3.5
21	2	4	4	4	4	5	5	3.5	5	4.5
88	1	3.4	3.4		3.4	3.4		3.4	3.4	
66	2	5	5	5	5	5	5	5	5	5
133	2	3.5	3.8	3.5	3.5	3.8	3.7	3.5	3.8	3.5
47	2	3.6	3.6	3.5	3.4	3.6	3.5	3.4	3.6	3.5
77	1	4.5	5.4	4.5	4.1	5.4	4	3.5	5.4	3.3

Note. ATS10M = Associative Thought Scale speed at the 10-minute mark; ATS13M = Associative Thought Scale speed at the 13-minute mark; ATS15M = Associative Thought Scale speed at the 15-minute mark; Part# = the participant's assigned number; Cond= the condition the participant was in (TV=1 and NoTV=2); 1 = participant's data for session 1; 2 = participant's data for session 2; 3= participant's data for session 3.

Table 6

Single Factor, Repeated Measures ANOVA comparing each of the dependent variables across the 3 sessions

Variable	*df*	*F*	*p*	*ES*
Warmup	2, 80	1.76	.18	.04
Distance	2, 82	3.52	.03	.08
ATS2MR	2, 80	.92	.40	.02
ATS2MS	2, 82	.02	.98	.00
ATS5MR	2, 80	.43	.65	.01
ATS5MS	2, 82	2.24	.11	.05
ATS8MR	2, 80	.88	.42	.02
ATS8MS	2, 82	1.10	.34	.03
ATS10MR	2, 80	.37	.70	.01
ATS10MS	2, 82	1.72	.19	.04
ATS13MR	2, 80	.18	.83	.01
ATS13MS	2, 82	1.78	.18	.04
ATS15MR	2, 80	.14	.87	.01
ATS15MS	2, 82	2.41	.10	.06
ATS Average Response	2, 80	.00	.10	.00
ATS Average Speed	2, 80	2.78	.07	.07
Time Preference	2, 80	.65	.53	.02
Preference Response	2, 80	1.75	.18	.04
Preference Response TV	2, 38	1.65	.21	.08

Note. Warmup= warm- up time for each of the 3 sessions; Distance= distance walked/ran for each of the 3 sessions; ATS2MR = response to the Associative Thought Scale at the 2-minute mark for each of the 3 sessions; ATS2MS = speed when given the Associative Thought Scale at the 2-minute mark for each of the 3 sessions; ATS5MR = response to the Associative Thought Scale at the 5-minute mark for each of the 3 sessions; ATS5MS = speed when given the Associative Thought Scale at the 5-minute mark for each of the 3 sessions; ATS8MR = response to the Associative Thought Scale at the 8-minute mark for each of the 3 sessions; ATS8MS = speed when given the Associative Thought Scale at the 8-minute mark for each of the 3 sessions; ATS10MR = response to the Associative Thought Scale at the 10-minute mark for each of the 3 sessions; ATS10MS = speed when given the Associative Thought Scale at the 10-minute mark for each of the 3 sessions; ATS13MR = response to the Associative Thought Scale at the 13-minute mark for each of the 3 sessions; ATS13MS = speed when given the Associative Thought Scale at the 13-minute mark for each of the 3 sessions; ATS15MR = response to the Associative Thought Scale at the 15-minute mark for each of the 3 sessions; ATS15MS = speed when given the Associative Thought Scale at the 15-minute mark for each of the 3 sessions; ATS Average Response= Average Associative Thought Scale response of all minute marks for each of the 3 sessions; ATS Average Speed = Average speed when given the Associative Thought Scale across all minute marks for each of the 3 sessions; Time Preference= time perception response for each of the 3 sessions; Preference Response = preference score for each of the 3 sessions; Preference Response TV = preference score for the TV condition for each of the 3 sessions.

Table 7

Average distance, preference response, and ATS responses at each of the minute marks for each participant's condition

Part #	Cond	Dist AVG	PrefR AVG	ATSAVG2MR	ATSAVG5MR	ATSAVG8MR	ATSAVG10MR	ATSAVG13MR	ATSAVG15MR
143	1	0.84	6	62	52	63	67	58	42
144	1	1.21	6	7	17	25	20	20	30
10	1	1.08	7	48	50	52	52	53	57
68	1	1.05	10	37	33	30	30	28	30
142	2	1.27	8	87	87	87	83	83	80
110	2	1.08	2	15	27	36	42	47	55
26	2	0.83	4	57	62	68	56	63	63
145	2	0.77	9	57	63	67	75	82	82
80	1	1.07	7	18	27	23	27	33	40
152	2	0.84	5	7	18	29	32	47	45
111	1	0.86	8	18	30	45	67	58	68
153	1	0.80	6	100	93	87	86	90	90
132	2	0.83	6	10	21	27	38	45	53
157	2	0.87	8	80	85	87	88	87	87
5	1	0.91	9	63	47	30	10	3	7
6	1	1.01	10	23	40	43	40	40	40
134	2	0.83	2	47	57	65	55	57	47
89	1	1.77	8	40	37	40	28	30	37
135	1	0.92	7	12	15	22	22	30	38
81	1	1.07	9	43	40	27	23	17	23
4	1	1.15	10	37	37	25	42	38	40
85	1	1.04	6	57	60	57	58	67	58
15	1	0.94	6	33	20	37	40	43	57
30	2	1.17	5	33	48	67	62	57	77
130	2	0.88	7	75	62	80	85	90	91
76	2	0.88	7	47	57	70	73	82	89
50	2	0.77	6	47	53	63	67	62	75
51	2	0.87	7	33	47	55	60	65	70
16	1	1.09	5	8	12	30	28	30	20
44	2	1.05	4	10	12	18	21	17	18
1	2	0.79	6	42	53	60	61	58	62
43	1	1.58	7	23	23	22	25	28	23
146	2	1.33	5	47	57	80	83	90	93
45	2	1.26	8	43	40	62	68	77	90
67	1	1.05	7	43	43	47	43	45	33

36	1	0.82	10	20	10	7	10	17	21
21	2	1.11	9	93	56	72	87	62	85
88	1	0.90	9	92	58	65	80	78	91
66	2	1.32	7	60	60	53	60	60	70
133	2	0.86	4	20	32	34	40	45	50
47	2	0.94	4	53	63	33	47	57	43
77	1	1.09	6	3	20	23	33	37	23

Note. Part# = the participant's assigned number; Cond= the condition the participant was in (TV=1 and NoTV=2); DistAVG = Average distance walked/ran across the 3 sessions; PrefAVG = Average preference score across the 3 sessions; ATSAVG2MR = Average response to the Associative Thought Scale at the 2-minute mark across the 3 sessions; ATSAVG5MR = Average response to the Associative Thought Scale at the 5-minute mark across the 3 sessions; ATSAVG8MR = Average response to the Associative Thought Scale at the 8-minute mark across the 3 sessions; ATSAVG10MR = Average response to the Associative Thought Scale at the 10-minute mark across the 3 sessions; ATSAVG13MR = Average response to the Associative Thought Scale at the 13-minute mark across the 3 sessions; ATSAVG15MR = Average response to the Associative Thought Scale at the 15-minute mark across the 3 sessions.

Table 8

Average warm-up time, time preference response, TV preference response, and overall Associative Thought Scale Response and Speed for each participant's condition

Part#	Cond	WarmAVG	TPAVG	PrefRTVAVG	ATSAVGR	ATSAVGS
143	1	75	15	5	57.22	3.4
144	1	5	14	8	19.72	5.0
10	1	31	17	7	51.94	4.0
68	1	16	13	7	31.39	3.9
142	2	8	14		84.44	5.1
110	2	30	17		36.78	4.4
26	2	26	17		61.61	3.1
145	2	84	13		70.83	3.0
80	1	66	17	6	28.06	4.3
152	2	42	14		29.44	3.2
111	1	58	18	8	47.78	3.4
153	1	53	21	6	91.06	3.1
132	2	110	18		32.50	3.2
157	2	71	13		85.56	3.4
5	1	37	13	8	26.67	3.5
6	1	34	16	7	37.78	3.9
134	2	39	14		54.44	3.3
89	1	30	14	7	35.28	6.9
135	1	68	17	8	23.06	3.5
81	1	77	14	9	28.89	4.4
4	1	41	11	7	36.39	4.6
85	1	44	18	9	59.44	3.7
15	1	71	13	6	38.33	3.3
30	2	61	15		57.22	4.6
130	2	38	14		80.56	3.3
76	2	73	17		69.61	3.2
50	2	158	19		61.11	3.0
51	2	90	18		55.00	3.3
16	1	80	17	7	21.39	4.2
44	2	74	18		16.06	3.9
1	2	47	15		55.94	3.2
43	1	36	16	6	24.17	6.0
146	2	78	15		75.00	5.7
45	2	60	13		63.33	6.2
67	1	95	17	7	42.50	3.9
36	1	35	15	9	14.00	3.4

21	2	11	17		75.67	4.4
88	1	83	16	7	76.92	3.4
66	2	186	18		60.56	5.0
133	2	52	20		36.78	3.8
47	2	12	17		49.44	3.5
77	1	50	16	5	23.33	4.2

Note. . Part# = the participant's assigned number; Cond= the condition the participant was in (TV=1 and NoTV=2); WarmAVG= Average warm- up time in seconds across the 3 sessions; TPAVG= Average time perception response across the 3 sessions; PrefRTVAVG = Average preference score across the 3 sessions for the TV condition; ATSAVGR= Average Associative Thought Scale response of all minute marks; ATSAVGS = Average speed when given the Associative Thought Scale across all minute marks.

Table 9

Single factor, between-subjects ANOVA, comparing each of the dependent variables across Tv and no TV conditions.

Variable		*n*	*M*	*SD*	*df*	*F*	*p*	*Es*
WarmAVG	TV	21	51.53	23.79	1, 41	1.31	.26	.03
	NoTV	21	64.29	45.22				
DistAVG	TV	21	1.06	.24	1, 40	1.57	.22	.04
	NoTV	21	.98	.19				
ATSAVG2MR	TV	21	37.53	26.20	1, 40	1.09	.30	.03
	NoTV	21	45.79	24.99				
ATSAVG2MS	TV	21	3.99	.94	1, 40	1.22	.28	.03
	NoTV	21	3.68	.87				
ATSAVG5MR	TV	21	36.30	19.81	1, 40	5.37	.03	.12
	NoTV	21	50.46	19.76				
ATSAVG5MS	TV	21	4.04	.67	1, 40	.07	.79	.00
	NoTV	21	3.99	.84				
ATSAVG8MR	TV	21	38.03	18.80	1, 40	10.58	.00	.21
	NoTV	21	57.75	20.45				
ATSAVG8MS	TV	21	4.13	.97	1, 40	.23	.63	.01
	NoTV	21	3.98	1.08				
ATSAVG10MR	TV	21	39.55	21.46	1, 40	11.62	.00	.22
	NoTV	21	61.05	19.37				
ATSAVG10MS	TV	21	4.10	.91	1, 40	1.61	.21	.04
	NoTV	21	3.78	.71				
ATSAVG13MR	TV	21	40.20	21.17	1, 40	14.26	.00	.26
	NoTV	21	63.33	18.44				
ATSAV132MS	TV	21	4.22	1.13	1, 40	.59	.45	.01
	NoTV	21	3.97	.99				
ATSAVG15MR	TV	21	41.33	22.01	1, 40	16.70	.00	.29
	NoTV	21	67.87	20.05				
ATSAVG15MS	TV	21	4.11	.92	1, 40	.02	.90	.00
	NoTV	21	4.07	1.39				
TPAVG	TV	21	15.60	2.21	1, 40	.38	.54	.01
	NoTV	21	16.02	2.11				
PrefRAVG	TV	21	7.57	1.65	1, 40	9.56	.00	.19
	NoTV	21	5.83	1.99				
ATSAVGR	TV	21	38.83	19.54	1, 40	10.13	.00	.20
	NoTV	21	57.71	18.91				
ATSAVGS	TV	21	4.10	.93	1, 40	.48	.49	.01
	NoTV	21	3.90	.95				

Note. WarmAVG= Average warm- up time in seconds across the 3 sessions; DistAVG= Average distance walked/ran across the 3 sessions; ATSAVG2MR = Average response to the Associative

Thought Scale at the 2-minute mark across the 3 sessions; ATSAVG2MS = Average speed when given the Associative Thought Scale at the 2-minute mark across the 3 sessions; ATSAVG5MR = Average response to the Associative Thought Scale at the 5-minute mark across the 3 sessions; ATSAVG5MS = Average speed when given the Associative Thought Scale at the 5-minute mark across the 3 sessions; ATSAVG8MR = Average response to the Associative Thought Scale at the 8-minute mark across the 3 sessions; ATSAVG8MS = Average speed when given the Associative Thought Scale at the 8-minute mark across the 3 sessions; ATSAVG10MR = Average response to the Associative Thought Scale at the 10-minute mark across the 3 sessions; ATSAVG10MS = Average speed when given the Associative Thought Scale at the 10-minute mark across the 3 sessions; ATSAVG13MR = Average response to the Associative Thought Scale at the 13-minute mark across the 3 sessions; ATSAVG13MS = Average speed when given the Associative Thought Scale at the 13-minute mark across the 3 sessions; ATSAVG15MR = Average response to the Associative Thought Scale at the 15-minute mark across the 3 sessions; ATSAVG15MS = Average speed when given the Associative Thought Scale at the 15-minute mark across the 3 sessions; TPAVG= Average time perception response across the 3 sessions; PrefAVG = Average preference score across the 3 sessions; ATSAVGR= Average Associative Thought Scale response of all minute marks; ATSAVGS = Average speed when given the Associative Thought Scale across all minute marks.

Table 10

Paired sample T tests, Comparison of Associative Thought Scale response at the 2 minute and 15 minute marks for the television and no television conditions

Variable	*M*	*SD*	*df*	*t*	*p*	*Es*
TVAVG2MR	37.48	26.30	20	-.808	.429	.18
TVAVG15MR	41.33	22.06				
NoTVAVG2MR	41.90	24.72	20	-5.516	.000	1.20
NoTVAVG15MR	67.86	20.1				

Note. TVAVG2MR= Average response to the Associative Thought Scale at the 2-minute mark for the TV condition; TVAVG15MR= Average response to the Associative Thought Scale at the 15-minute mark for the TV condition; NoTVAVG2MR= Average response to the Associative Thought Scale at the 2-minute mark for the no TV condition; NoTVAVG15MR= Average response to the Associative Thought Scale at the 15-minute mark for the no TV condition.

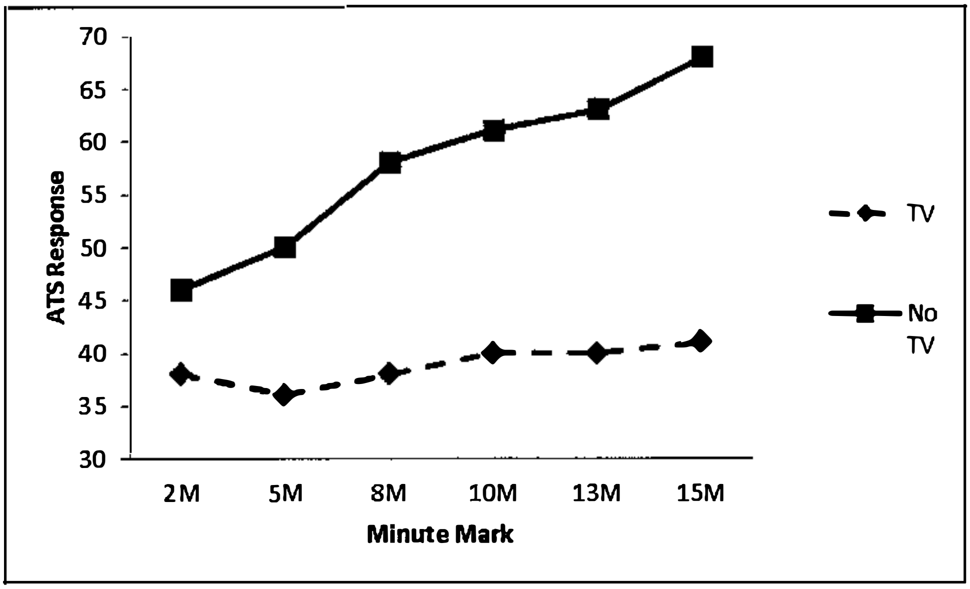

Figure 1. Comparison of Associative Thought Scale response at each of the minute marks for the television and no television conditions. A significant difference was found between the 2 minute and 15 minute marks for the no television condition. No significant difference was found between the 2 minute and 15 minute marks for the television condition.

Appendix A

Recruitment Script

"Hi. My name is Karen Casilio. I'm doing a research study on exercise for my Master's Thesis at the College at Brockport and was wondering if you'd like to participate. My study involves completing some questionnaires, coming into the gym 3 times, and running or walking on a treadmill each time for a maximum of twenty minutes. If you are interested in more details, you can read the consent form now. Participants will be selected if they match certain age and health criteria. All of the data I collect will be kept confidential. You must be 18 years or older to participate."

Appendix B

Recruitment Flyer

Need Participants!

- My name is Karen Casilio.
- I'm doing a research study on exercise for my Master's Thesis at the College at Brockport and need participants.
- My study involves completing some questionnaires, coming into the gym 3 times, and running or walking on a treadmill each time for a maximum of twenty minutes.
- If you are interested in more details, please contact me at kcasi1@brockport.edu.
- Participants will be selected if they match certain age and health criteria.
- All of the data I collect will be kept confidential.
- You must be 18 years or older to participate.

Appendix C

Physical Activity Readiness Questionnaire (PAR-Q) and You

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly. Please circle Yes or No for each question.

Yes No 1. Has your doctor ever said that you have a heart condition <u>and</u> that you should only do physical activity recommended by a doctor?

Yes No 2. Do you feel pain in your chest when you do physical activity?

Yes No 3. In the past month; have you had chest pain when you were not doing physical activity?

Yes No 4. Do you lose your balance because of dizziness or do you ever lose consciousness?

Yes No 5. Do you have a bone or joint problem that could be made worse by a change in your physical activity?

Yes No 6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?

Yes No 7. Do you know of <u>any other reason</u> why you should not do physical activity?

*Adapted by Karen Casilio from the Physical Activity Readiness Questionnaire (PAR-Q) and You (American College of Sports Medicine, 1997)

Appendix D

Screening Questionnaire

Please fill out the questions below to the best of your knowledge:

Gender:

Age:

How often do you walk/run each week? ____times a week

How long do you walk/run each time, on average? _______ Time in minutes

What is the average distance you walk/run a week? _____mile(s)

Appendix E

Associative Thought Questionnaire

Instructions read before trial, after the instructions on how to use the treadmill: "During the experiment, I will ask you a question. Internal thoughts are thoughts that are focused on bodily symptoms or how the body is reacting. External thoughts are thoughts directed at factors outside of the body and serve as a distraction. I will be asking you about the percentage of internal thoughts you are currently experiencing. I want you to respond with a number from 0 to 100. 100 means that all of your thoughts are internal. If you respond with a 0 rating, it means all of your thoughts are external. Do you understand the rating scale?"

If participant responds 'yes,' then proceed with trial.

If participant responds 'no,' explain more.

During trial, experimenter will say, "On a scale from 0 to 100, what percentage of your thoughts are currently internal thoughts? Remember 100 means completely thinking about your body's responses and 0 means you are thinking about something else."

Appendix F

No Television Condition: Time Perception and Preference Questions

How long do you think you've been walking/running? ________minutes

On a scale from 0 to 10 with 0 meaning not at all and 10 meaning a lot, please circle how much you enjoyed walking/running on the treadmill?

0 1 2 3 4 5 6 7 8 9 10

Appendix G

Television Condition: Time Perception and Preference Questions

How long do you think you've been walking/running? ________minutes

On a scale from 0 to 10 with 0 meaning not at all and 10 meaning a lot, please circle how much you enjoyed walking/running on the treadmill?

0 1 2 3 4 5 6 7 8 9 10

On a scale from 0 to 10 with 0 meaning not at all and 10 meaning a lot, please circle how much you enjoyed the television show you were watching while you walked/ran on the treadmill?

0 1 2 3 4 5 6 7 8 9 10

Appendix H

Thoughts during Exercise

What were you thinking about while you were walking/running on the treadmill today?

If you can remember, what were you thinking about while you were walking/running on the treadmill the last two sessions?

Appendix I

Consent Form

STATEMENT OF INFORMED CONSENT

The purpose of this research project is to develop a new exercise program that utilizes a treadmill. During the study, you will be asked to walk or run on a treadmill for a maximum of 20 minutes, at a comfortable pace for you, and you will be completing some questionnaires and asked a few questions verbally. This research project is also being conducted in order for me to complete my masters thesis for the Department of Psychology at the College at Brockport, SUNY.

In order to participate in this study, your informed consent is required. You are being asked to make a decision whether or not to participate in the project. If you want to participate in the project, and agree with the statements below, please sign your name in the space provided at the end. You may change your mind at any time and leave the study without penalty, even after the study has begun.

I understand that:

1. My participation is voluntary and I have the right to refuse to answer any questions and withdraw from the study at any time.
2. My confidentiality is protected. My name will not be written on any of the surveys. There will be no way to connect me to my written surveys. If any publication results from this research, I would not be identified by name.
3. My participation involves first completing two questionnaires that are estimated to take a total of 5 minutes. If I am willing, I may also be contacted to complete three sessions. Participants will be selected if they match certain age and health criteria. These sessions at Rochester Fitness Center in Rochester, N.Y. will involve walking or running on a treadmill for a maximum of 20 minutes each session. These sessions will take place on different days, at approximately the same time. I will also be asked to answer one question multiple times while I am walking or running and answer up to three questions immediately after I am done running. It is estimated that each of these sessions will not last more than a total of 30 minutes.
4. I may not drink water while on the treadmill, but I may stop at any time should I need a drink of water
5. I will receive a bottle of water after each session I participate in and will be entered into a lottery after completing the study.
6. The potential benefits include helping to learn about exercise.
7. The potential risks include possible boredom, fatigue, and, as with any physical activity, muscle soreness and/or injury.
8. Approximately 50 people will take part in this study. The results will be used for the completion of a master's thesis by the primary researcher.

9. Data will be kept in a locked filing cabinet by the investigator. Data and consent forms will be destroyed by shredding when the research has been accepted and approved.

I am 18 years of age or older. I have read and understand the above statements. All my questions about my participation in this study have been answered to my satisfaction. I agree to participate in the study realizing I may withdraw without penalty at any time during the study. Signing this consent form indicates my consent to participate.

If you have any questions you may contact:

Primary researcher	Faculty Advisor
Karen Casilio	Dr. Forzano
585-395-5428	585-395-2759
kcasi1@brockport.edu	lforzano@brockport.edu
Department of Psychology	Department of Psychology

Participant Signature	Date

Appendix J

Contact for future sessions

Would you be willing to be contacted for future sessions of this study that would involve a maximum of 25 minutes on a treadmill for three sessions?

Yes No

If yes, please provide the following information:

First Name:

Phone #:

E-mail address:

Please note that not everyone who provides the above contact information will be contacted because we can not accommodate everyone in this study.

Thank you for your interest in this study.

Appendix K

Phone Script

"Hi, my name is Karen Casilio. Do you remember agreeing to be contacted about participating in a study involving exercise and that you would like to continue the study? I was wondering if we could schedule a time for you to come in and participate."

Appendix L

Television Condition Instructions

Instructions read to participant by the experimenter in the television condition: "The experiment consists of three sessions that will be run on different days at times arranged. For each session you are required to run/walk on the treadmill at a pace at which you feel comfortable, for no longer than twenty minutes. Before we begin please remove all cell-phones, watches, and other electronic devices and place them in your locker.

Now, I will need you to choose a channel you would like to watch on the television while you are exercising. Once you have begun, I cannot change the channel. You are required to watch the television throughout the session. Now, which channel would you like to watch? It can not be a channel that has the news on it.

You will be unable to drink anything while you are on the treadmill, so if you need a drink please get one now. If you do feel as if you need water while you are running, let me know and I will stop the experimental session so you can get water.

The treadmill will start working once you press the quick start button. I suggest that you have a warm-up period (of a few minutes) to get used to the machine and get to a pace at which you feel comfortable to perform. I will start the experiment when you feel ready to begin the experimental procedure, so let me know when you have completed warming up. I will tell you when you are finished. The display of the running machine will be covered up, except for the speed, for the whole session. The adjustment of the speed of the treadmill is here [experimenter points to control] and you can increase or decrease the speed freely throughout the experiment. Please remain focused on the television."

*Adapted from Edworthy and Waring (2006)

Appendix M

No Televisiȯn Condition Instructions

Instructions read to participant by the experimenter in the no television condition: "The experiment consists of three sessions that will be run on different days at times arranged. For each session you are required to run/walk on the treadmill at a pace at which you feel comfortable, for no longer than twenty minutes. Before we begin, please remove all cell-phones, watches, and other electronic devices and place them in your locker.

You will be unable to drink anything while you are on the treadmill, so if you need a drink please get one now. If you do feel as if you need water while you are running, let me know and I will stop the experimental session so you can get water.

The treadmill will start working once you press the quick start button. I suggest that you have a warm-up period (of a few minutes) to get used to the machine and get to a pace at which you feel comfortable to perform. I will start the experiment when you feel ready to begin the experimental procedure, so let me know when you have completed warming up. I will tell you when you are finished. The display of the running machine will be covered up, except for the speed, for the whole session. The adjustment of the speed of the treadmill is here [experimenter points to control] and you can increase or decrease the speed freely throughout the experiment. Please look forward while walking/running."

*Adapted from Edworthy and Waring (2006)

Appendix N

End of session

“Here is your water bottle for today. Thank you for participating. Would you like to continue the study and schedule the next session?”

“It is important that you do not talk about the study to anyone until I finish collecting my data.”

Appendix O

Debrief

After all sessions are completed the experimenter will verbally debrief participants: "At the beginning of this study I told you that the purpose of this study was to develop a new exercise program. The real purpose is to see if walking or running while watching television will increase the amount you exercise. More specifically, I wanted to see if watching television while exercising would function as a distraction so you would not realize you were exercising longer. I wanted to know if participants watching the television would stay in the dissociative strategy longer. Recall that the associative strategy is thinking about your body's responses and the dissociative strategy is thinking about something else. For example, when you are driving and listening to music, you may be distracted from driving and forget to make a turn. This would be you using the dissociative strategy. Research shows that when you are distracted, time seems to go by faster; and studies on exercise have shown that listening to music while running can make the experience more enjoyable, seem to go by faster, and make you exercise longer. With the growing health concerns associated with obesity and lack of exercising, such as chronic diseases, including cancer, it is becoming increasingly more important to find ways to get people to exercise more. It is very important you do not discuss this study with anyone who may be in the study because that could affect the results I obtain. Everybody must come in just like you did, not knowing the real purpose of the study. If you want to know the results after I have completed the study you can contact me. My information is listed on the copy of the consent form I gave you."

Appendix P

Lottery Script

Lottery drawing:

Name: ______________________________

Email: _____________________________

Phone number: _____________________

Appendix Q

Internal and External Thought Examples

Internal Thoughts:

Focusing on performance

Wondering why running in the first place

Paying attention to form or technique

Paying attention to running rhythm

Monitoring specific body sensations (e.g., leg tension, breathing rate)

Paying attention to general level of fatigue

Focusing on how much suffering

Focusing on staying loose and relaxed

Wishing the run would end

External Thoughts:

Enjoy the television show

Trying to ignore all physical sensations

Specific thoughts about the television show

Letting mind wander (daydreaming)

Singing a song in head

Thinking about school, work, social relationships, etc.

Making plans for the future (e.g., grocery list)

Writing a letter or paper in head

Reflecting on past experiences

Counting (e.g., objects in the environment)

Meditating (focusing on a mantra)

Thinking about pleasant images

Trying to solve problems in life